

umbo and as many lines of growth. The female of this latter species has a very different shell. All species of *Limnadiopsis*, the other genus of the family, are unique in having a very noticeably serrated dorsal shell margin.

The head characters of *M. serratura* are very different from those of the other members of the family, although the general form of the head is similar to that of the other genera. As indicated by Daday (1915, 1925) the Limnadiidae are characterized by a prominent, pyriform frontal appendage. This frontal organ in *M. serratura* is very rudimentary, not pyriform, and it is raised only slightly above the dorsal surface of the head. What may be the evolutionary status of this very characteristic limnadiid feature among the different genera cannot be indicated at this time. The first antennae of all the other members of the family are elongate, unsegmented appendages with a series of dorsally located sensory papillae. The 2-segmented first antennae of *M. serratura* are more like those of the Lynceidae than any other of the Conchostraca. These appendages are strongly diagnostic for the present genus and species.

HELMINTHOLOGY.—*Some cestodes from Oregon shrews, with descriptions of four new species of Hymenolepis Weinland, 1858.* BETTY LOCKER, Reed College, Portland, Ore., and ROBERT RAUSCH, Arctic Health Research Center, Anchorage, Alaska.

A large number of shrews of the genus *Sorex* has been examined in connection with the investigation of the helminth parasites of Oregon mammals. It is the purpose of this paper to give a preliminary list of the cestodes obtained from these shrews, together with the description of new species. More complete information on these and other helminths will be published by one of us (B. L.) at a later date.

The helminths reported here have been collected from *Sorex v. vagrans* Baird, the most common shrew of western Oregon during the time these collections were made. Host determinations were made by comparing our material with specimens in the mammal collections of the U. S. National Museum.

In addition to the species herein described, we have also recorded three previously described cestodes from Oregon shrews. These observations appear to be the first to be

As pointed out by Linder (1945) many species of *Limnadia* have only 16 pairs of trunk appendages, as does *M. serratura*. Other members of the family may have up to 32 pairs. The first two pairs of male claspers are characteristic, but, as on the other trunk appendages, the branchiae are much larger and proportionately wider than in the other genera. The egg-bearing exopodite of the ninth and tenth female appendages is proportionately much longer than typically found in the Limnadiidae. The telson, with the inferior distal spine, is more like that of *Eulimnadia*, than that of the other genera.

It seems as if this species, *Metalimnadia serratura*, represents a newly found intergeneric line of evolution in the family Limnadiidae.

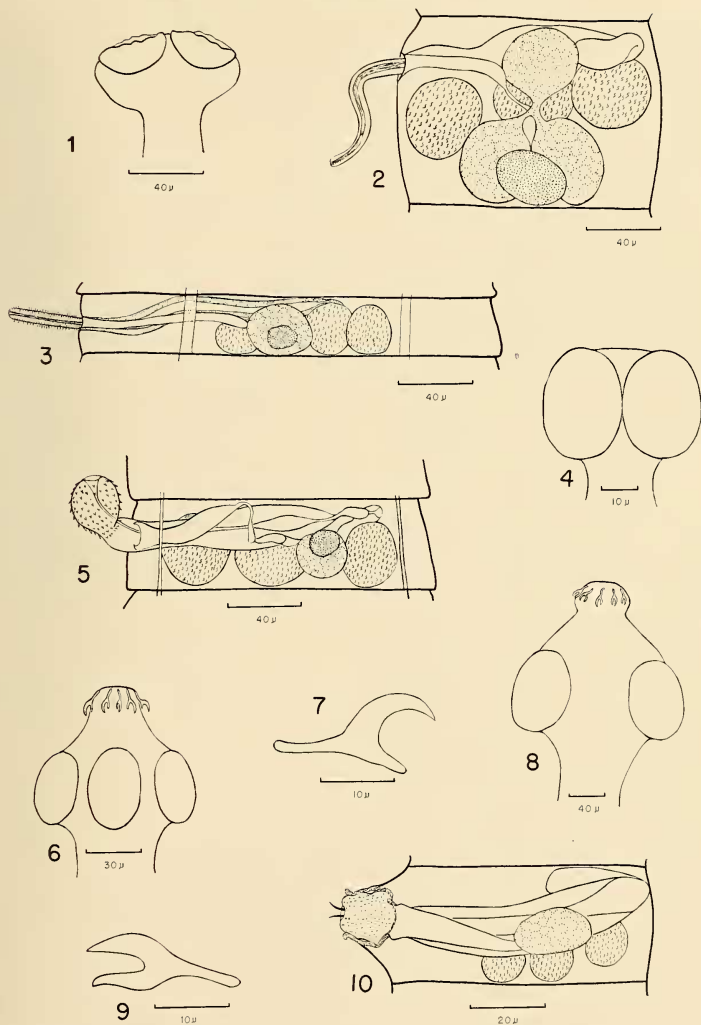
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made on cestodes in shrews from the Pacific coast region. Each species is considered separately below.

Protogynella blarinae Jones, 1943

This minute cestode of uncertain status was found to occur commonly in Oregon shrews. The Oregon specimens were not considered in detail, since another worker has already undertaken the restudy of the species; however, as far as was determined these cestodes were morphologically identical with those found in shrews (*Sorex c. cinereus* Kerr; *Blarina brevicauda* Say) in the eastern States. It was noted, however, that the Oregon specimens had a much larger number of hooks than was reported from Wisconsin shrews (Rausch and Kuns, 1950). Because of the minute size and proximity of these rostellar hooks, an accurate count was impossible; however, the number is near one hundred. Whether or not this represents only variation can be determined on the basis of the study of specimens from different geographical locations.



FIGS. 1-10.—1, Scolex of *H. macyi*; 2, mature segment of *H. macyi*; 3, mature segment of *H. kenki*; 4, scolex of *H. kenki*; 5, mature segment of *H. sphenomorphus*; 6, scolex of *H. sphenomorphus*; 7, rostellar hook of *H. sphenomorphus*; 8, scolex of *H. intricatus*; 9, rostellar hook of *H. intricatus*; 10, mature segment of *H. intricatus*.

Hymenolepis falculata Rausch and Kuns, 1950

Although not a common species when compared with some of the other cestodes occurring in Oregon shrews, *H. falculata* was collected frequently. This is perhaps the most common species occurring in *Sorex cinereus* in southern Wisconsin, but it has not yet been recorded from other localities. The specimens examined from *S. vagrans* were morphologically identical with material from the type locality.

Hymenolepis schilleri Rausch and Kuns, 1950

The study of abundant material from Oregon shrews has allowed some further observations on the morphology of *H. schilleri*, which so far is known only from the two specimens upon which the original description was based. It has been found that the number of rostellar hooks is variable, and a maximum number of 32 has been recorded. In regard to other morphological characters, the original description is adequate.

Hymenolepis macyi, n. sp.

Figs. 1, 2, 11

Diagnosis.—Hymenolepididae. Strobila length up to 2 mm; greatest width, attained in gravid segments, 500 μ . Strobila characterized by relatively large size of gravid segments, up to 500 by 250 μ . Transition from immature to mature segments, and from mature to gravid segments, very abrupt; this results in tripartite appearance of strobila. There are usually 4 to 6 segments in each (immature, mature, and gravid) section of strobila, with maximum possible segment number about 18. Immature and early mature segments wider than long; late mature segments nearly square; gravid segments oval. Scolex 180 to 230 μ in diameter, strongly set off from neck; rostellum absent. Suckers oval, about 100 μ long. Genital pores unilateral and dextral, situated near anterior end of margin of segment. Cirrus sac, as much as 400 μ long by 70 μ wide, extends nearly across mature segment to anterior aporal corner. Cirrus unarmed. External seminal vesicle strongly developed. Testes in mature segments measure about 35 μ in diameter, and are situated in diagonal row with aporal testis most anterior. Vagina, about 8 μ in diameter in mature segments, situated ventral to cirrus sac; it narrows abruptly just poral to ovary. Seminal receptacle not noted. Ovary trilobed, situated near center of segment; two lobes posterior and one anterior. Ovarian lobes subspherical, each about 30 μ in diameter in mature segments. Vitelline gland on midline of

segment at posterior edge of ovary, and ventral to it. Development of uterus abrupt; gravid segment capsulelike, with thick parenchyma around egg-filled uterus. Genital ducts persist in terminal segments. Eggs spherical, from 30 to 32 μ in diameter.

Host.—*Sorex v. vagrans* Baird.

Type locality.—Portland, Oreg.

Habitat.—Small intestine.

Type.—A slide containing an entire specimen has been deposited in the Helminthological Collection of the U. S. National Museum, no. 47531.

Hymenolepis macyi appears to be well characterized by the unusual gross appearance of the strobila, and can be differentiated on this basis from the other unarmed soricid species of *Hymenolepis* (*H. alpestris* Baer, 1931; *H. anthocephalus* Van Gundy, 1935; *H. diaphana* Kholodkowski, 1906; *H. globosa* Baer, 1931; *H. minuta* Baer, 1926; *H. soricis* Baer, 1925). It can be further differentiated on the basis of cirrus sac position and size, arrangement of testes and ovary, and egg size.

This cestode is named in honor of Dr. Ralph W. Macy, chairman, department of biology, Reed College, Portland, Oreg. This opportunity is taken to express appreciation of his providing facilities and working space in connection with part of this work.

Hymenolepis kenki, n. sp.

Figs. 3, 4, 12

Diagnosis.—Hymenolepididae. Strobila 1 to 2 mm long; greatest width, attained in gravid segments, slightly over 200 μ . Strobila consists of about 50 segments, all wider than long with a slight relative increase in length in gravid segments. Scolex 280 to 340 μ in diameter; rostellum absent. Suckers strongly developed, elliptical, about 180 μ long. Genital pores unilateral and dextral, situated near middle of segmental margin. Cirrus sac, usually about 100 μ long by about 20 μ wide in mature segments, extends aporally to just beyond midline of segment. Cirrus thickly set with fine spines. External seminal vesicle present. Testes spherical, about 30 μ in diameter in mature segments; situated in straight line with two aporal and one poral. Vagina ventral to cirrus sac; diameter uniform and course direct as far aporal as poral margin of ovary. Seminal receptacle not evident. Ovary subspherical, about 30 μ in length, situated near midline of segment. Vitelline gland ventral to ovary. Uterus appears early in strobila as spheri-

cal body which gradually enlarges to fill entire gravid segment. Eggs apparently spherical, 19 to 22 μ in diameter; fully-developed eggs in terminal segments highly distorted by fixation in all available material.

Host.—*Sorex v. vagrans* Baird.

Type locality.—Portland, Oreg.

Habitat.—Small intestine.

Type.—A slide containing paratype material has been deposited in the Helminthological Collection of the U. S. National Museum, no. 47532.

On the basis of testes arrangement (straight line) as well as by other morphological characters, *H. kenki* can be differentiated from the soricid species of *Hymenolepis* which have the testes arranged in a triangle (*H. anthocephalus* Van Gundy, 1935; *H. alpestris* Baer, 1931; *H.*

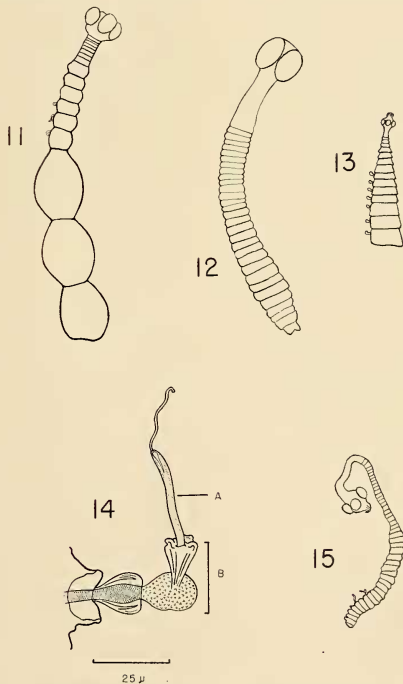
diaphana Kholodkowsky, 1906; *H. globosa* Baer, 1931). It may be differentiated from *H. minuta* Baer, 1926, and from *H. soricis* Baer, 1925, which also have the testes arranged in a straight line, by size and relative length of cirrus sac, by egg size (?), and other morphological characters. However, *H. soricis* is poorly known, and *H. minuta* was described on the basis of an immature specimen.

This cestode is named in honor of Dr. Roman Kenk, of Washington, D. C.

***Hymenolepis sphenomorphus*, n. sp.**

Figs. 5-7, 13

Diagnosis.—Hymenolepididae. Strobila length up to 800 μ ; greatest width, attained in terminal segments, about 200 μ . Wedge-shaped strobila of



FIGS. 11-15.—11, Entire strobila of *H. macyi*; 12, entire strobila of *H. kenki*; 13, entire strobila of *H. sphenomorphus*; 14, semidiagrammatic drawing of cirrus (A) and vagina (B) of *H. intricatus*, showing attachment; 15, entire strobila of *H. intricatus*. (Figs. 11, 12, 13, and 15 all drawn to same scale with the aid of a projector.)

characteristic gross appearance. Segments, about 15 in number, wider than long; they become relatively longer when gravid. Strobila margins serrate. Scolex 90μ in diameter, distinctly set off from neck. Rostellum well developed, armed with 10 hooks 16 to 20μ long. Suckers elliptical, about 45μ long. Genital pores unilateral and dextral, situated near middle of margin of segment. Cirrus sac attains length of 110μ and width of 25μ in mature segments, and extends aporally beyond midline of segment. Cirrus strongly developed, and furnished with spined terminal knob 30 to 32μ in diameter. External seminal vesicle present. Subspherical to ovoid testes about 35μ in diameter in mature segments; testes arranged in straight line, with two poral to ovary, and one aporal. Thin-walled vagina ventral to cirrus sac; about 20μ in diameter near genital pore. Vagina narrows abruptly to slender duct at distance of about 60μ from poral margin of segment; small seminal receptacle formed just poral to ovary. Ovary subspherical, about 35μ in diameter, situated aporal of midline ventral to testes. Vitelline gland ovoid, situated ventral to ovary. Uterus gradually enlarges in central part of segment; gravid segments completely filled with eggs. Eggs measure 16 to 19μ .

Host.—*Sorex v. vagrans* Baird.

Type locality.—Multnomah Falls, Oreg.

Habitat.—Small intestine.

Type.—A slide containing an entire specimen has been deposited in the Helminthological Collection of the U. S. National Museum, no. 47533.

Hymenolepis sphenomorphus is characterized grossly by the very small, wedge-shaped strobila in combination with the extreme relative size of the cirrus. It is differentiated from the other soricid species which have 10 hooks (*H. blarinae* Rausch and Kuns, 1950; *H. jacobsoni* von Linstow, 1907; *H. parva* Rausch and Kuns, 1950; *H. scutigera* (Dujardin, 1845); *H. singularis* Kholodkowsky, 1913) by differences in hook size and shape, size and location of cirrus sac, and character of the cirrus.

Six specimens of this cestode were obtained from a shrew captured under a log along the Columbia River near Multnomah Falls. This parasite was collected but once, and was the least common form considered here.

***Hymenolepis intricatus*, n. sp.**

Figs. 8-10, 14, 15

Diagnosis.—Hymenolepididae. Strobila length 1.2 to 2 mm; greatest width, attained near middle

of strobila, about 100μ . Strobila margins not serrate; all segments wider than long. Total number of segments 60 to 75. Scolex strongly developed, 160 to 180μ in diameter; distinctly set off from unsegmented neck. Rostellum well developed, armed with 10 hooks 17 to 21μ long. Suckers 90 to 100μ long. Genital pores unilateral and dextral, situated near middle of margin of segment on projection of segmental margin. Cirrus sac large, attaining length of 75 by 16μ in mature segments, and extending aporally nearly to margin of segment. External seminal vesicle well developed. Cirrus spinose and slender. Testes situated in diagonal line, all aporal of midline. Spherical testes measure about 10μ in mature segments. Vagina thin-walled, of about same diameter as cirrus sac. Terminal part of vagina highly specialized, having a bulblike, heavily spined section which adjoins a terminal, funnel-like structure whose wall is supported by several rigid spicules. This organ is capable of being extruded, and appears to function in connection with clasping during copulation. No seminal receptacle noted. Ovary subspherical, up to 20μ long in mature segments. Vitelline gland not observed. Uterus develops gradually as single body; gravid segments completely filled with eggs. Eggs ovoid, apparently about 25μ in length; accurate measurement prevented by distortion resulting from fixation.

Host.—*Sorex v. vagrans* Baird.

Type locality.—Portland, Oreg.

Habitat.—Small intestine.

Type.—A slide bearing paratype material has been deposited in the Helminthological Collection of the U. S. National Museum, no. 47534.

This species may be differentiated from related forms having 10 hooks (see above) on the basis of hook size and shape, size and position of cirrus sac and other genital organs, and particularly by the apparently unique development of the terminal part of the vagina.

The finer details of the vagina of this cestode could not be completely worked out, because of the extremely small size; however, it is evident that the vagina demonstrates a much higher degree of specialization than is ordinarily seen in the species of *Hymenolepis*. The vagina is capable of being extruded to a distance of more than 20μ beyond the margins of the genital atrium, which itself possesses a thick, chitinlike wall. The heavy spicules seen in the terminal part of the vagina seem to act as a support for this structure, but their function is not clearly understood. From ob-

servations on a large series of these cestodes, it is concluded that once contact is established between the cirrus and vagina, separation may not often occur. Both intersegmental and interstrobilar copulation were recognized, and in the case of the latter, apparently as a result of manipulation when the worms were removed from the host, it was commonly seen that either the vagina or cirrus was torn completely free from the segment. This resulted in the two organs remaining tightly attached (Fig. 15).

This cestode was frequently observed in Oregon shrews and was one of the common species, along with *H. macyi* and *H. kenki*.

DISCUSSION

The description of the four species of cestodes here brings the total number of species recorded from North American shrews to 11. All the North American species are well characterized and can be readily differentiated. It would appear that the species of *Hymenolepis* parasitic in North American shrews have evolved quite separately from those found in the Eurasian mammals, since no Eurasian species has so far been recorded from North America. When more nearly complete information has been obtained there may be derived from it some under-

standing of the zoogeographically important implications which are involved.

SUMMARY

Seven species of cestodes have been recorded from Oregon shrews (*Sorex v. vagrans* Baird). Of these, *Protogynella blarinae* Jones, 1943, *Hymenolepis falculata* Rausch and Kuns, 1950, and *H. schilleri* Rausch and Kuns, 1950, are recorded here for the first time from the western part of North America. Four species of *Hymenolepis*, *H. macyi*, *H. kenki*, *H. sphenomorphus*, and *H. intricatus*, are described as new.

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ORNITHOLOGY.—*The long-tailed sugarbird of eastern Rhodesia*.¹ HERBERT FRIEDMANN, U. S. National Museum.

In his second paper on the birds of Gazaland, Swynnerton (Ibis, 1908: 31-32) recorded the Natal long-tailed sugarbird from the scrub-grown kloofs of the Melsetter District, extreme eastern Southern Rhodesia, and remarked that the bird was previously unknown north of the Limpopo, being recorded only from Natal, Swaziland, and the Transvaal. However, some eight years earlier Stark (*Fauna of South Africa, Birds*, **1**, 273. 1900) included Gazaland in the range of the species, although on what basis he did so is a mystery as there appear to be no published records prior to Swynnerton's. Indeed,

several authors, such as Shelley and Reichenow, who refer to Stark's book, give the distribution of the species merely as Natal, Zululand, and the Transvaal, and either overlooked or doubted the stated occurrence in Gazaland. Since Swynnerton's day no notable extension of range has been reported for the bird in spite of very considerable work in eastern parts of the Union of South Africa, Southern Rhodesia, and Portuguese East Africa. It appears, then, that the bird has a very discontinuous range, which, in light of present knowledge, may be stated as from Pondoland in the eastern Cape Province, through Natal, Zululand, Swaziland, and the Drakensberg Mountains north to the Zoutpansberg area of the eastern Transvaal, and then again, after a long geographic gap of at least 200 miles of unsuitable

¹ Published by permission of the Secretary of the Smithsonian Institution. For the loan of specimens for study in the present connection I am indebted to the authorities of the American Museum of Natural History, the Chicago Natural History Museum, and the National Museum of Southern Rhodesia.